UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/748,207	HOLMQVIST ET AL.
	Examiner	Art Unit
	NIKHIL SRIRAMAN	3664

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2008*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All   b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

This is a final Office Action on the merits. Applicant's communication cancelling

claims 1-3 and adding claims 4-8 has been received and entered. Thus, claims 4-8 are

currently pending and addressed below.

Priority

1.   Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which

papers have been placed of record in the file.

Information Disclosure Statement

2.   The listing of references in the specification is not a proper information disclosure

statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other

information submitted for consideration by the Office, and MPEP § 609.04(a) states,

"the list may not be incorporated into the specification but must be submitted in a

separate paper." Therefore, unless the references have been cited by the examiner on

form PTO-892, they have not been considered.

Specification

3.   35 U.S.C. 112, first paragraph, requires the specification to be written in "full,

clear, concise, and exact terms." The specification is replete with terms which are not

clear, concise and exact. The specification should be revised carefully in order to

comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or

verbose terms used in the specification are:

Page 11, lines 16 and 17 recite "horisontal plane".

Page 11, line 22 recites "athwart"

Page 11, line 24 recites "origo"

Page 17, line 16 recites "centre"

Page 19, line 17 recites "hypotesis"

Page 29, line 16 recites "the for the above"

These examples are intended as only illustrative and not exhaustive. It is

incumbent upon Applicant to rectify the numerous defects found in the specification

language such that the language and format is compliant with U.S. Patent Office

Examination standards.

Claim Objections

4.   The claim amendments are not in compliance with 37 CFR 1.121. The

introduction of a claim by amendment not previously present must be accompanied by

the term "new". Similarly, the status identifier of cancelled claims must accompany the

claim number. *Also See* MPEP 714.

Claim Rejections - 35 USC § 112

5.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

6.   The claims are generally narrative and indefinite, failing to conform with current

U.S. practice. They appear to be a literal translation into English from a foreign

document and are replete with grammatical and idiomatic errors.

Examples of such defects are found in line 2 of claim 4, that recites 'a mobile

robot such as an autonomous vehicle or machinery." The phrase "such as" renders the

claim indefinite because it is unclear whether the limitations following the phrase are

part of the claimed invention. See MPEP § 2173.05(d).

Further regarding claim 4, lines 26-27 state "such an apparatus can be. . .". It is

unclear whether the limitations following this phrase are part of the claimed invention.

Further regarding claim 4, line 65 recites "e.g." It is unclear whether the

limitations following this phrase are part of the claimed invention.

Further regarding claim 4, line 15 recites "a coordinate system fixed to ground".

Line 24 goes on to recite "a fixed to ground coordinate system." The similarity in

meaning and language suggests these coordinate systems are one in the same, while

the antecedent basis suggests otherwise. Accordingly, it is unclear what the true claim

scope is in view of the language ambiguity. Same with "a fixed to vehicle coordinate

system" that appears in lines 29 and 34.

Further regarding claim 4, line 17 recites "current terrain surface measurements",

while line 31 recites "the current shape and location of the terrain surface". The

difference in language suggests these are two distinct limitations, while the antecedent

basis in the subsequently appearing limitation suggests otherwise. Accordingly, it is

unclear what the true claim scope is in view of the language ambiguity.

Further regarding claim 4, line 81 recites "the actuators and sensors" where these terms are not previously introduced. The absence of similar language earlier in the claim suggests these are intended as new limitations, while the antecedent basis suggests otherwise. Accordingly, it is unclear what the true claim scope is in view of the language ambiguity.

Further regarding claim 4, line 66 recites "a neighbourhood" that appears to be a misspelling of "neighborhood".

These examples are intended as only illustrative and not exhaustive. It is incumbent upon Applicant to rectify the numerous defects found throughout all the language of all the claims such that the language and format is compliant with U.S. Patent Office Examination standards.

Claim Rejections - 35 USC § 102

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8.   Claims 4-8 are rejected under 35 U.S.C. 102(a/e) as being anticipated by Stentz et al. (6,363,632).

[AS BEST UNDERSTOOD] Regarding claim 4, Stentz et al. discloses a method for automatic handling of bulk material and other goods where this handling comprises loading, unloading and transport executed by a mobile robot such as an autonomous vehicle or machinery, for industrial applications within limited work areas, outdoor as well as indoor or under ground (Col. 2, lines 34-67), characterised by:

One or several loading zones are defined for the work area, such loading zones being the sole parts of the work area where loading and working of a volume of material is allowed for collection of material or other objects, and one or several unloading zones being the sole parts of the work area where unloading material and other objects is allowed, and one or several obstacle free zones which together with the loading and unloading zones are the only parts of the work area where autonomous vehicle navigation and autonomously controlled load handling implement movements are allowed (Col. 2, lines 34-67);

A reference surface is defined for the work area as being the supporting surface for material volumes and other handling objects, such a reference surface being accurately defined in a coordinate system fixed to ground by means of the x-, y- and z-coordinates for an ordered set of points on the same reference surface, this surface being compared with current terrain surface measurements including the surface of material volumes and other handling objects located within loading and unloading zones, and where these measurements are used for optimising parameters for vehicle

navigation and vehicle load handling implement movements in loading and unloading

tasks as well as for obstacle detection (Col. 6, lines 46-67; Fig. 6);

The position of the mobile robot is obtained, in real time and outdoor as well as

indoor or under ground, by an apparatus for accurate determination of the position in a

fixed to ground coordinate system in three dimensions x, y and z and the three attitude

angles heading, pitch and roll, in all comprising a position determination in sex degrees

of freedom of a fixed to vehicle coordinate system, where such an apparatus can be a

laser-optic system in which the position is determined through azimuth and elevation

measurements, with an on board the vehicle rotating laser- optic sensor in a fixed to

vehicle coordinate system, towards a number of reflectors with known coordinates in the

fixed to ground coordinate system (Col. 10, lines 54-64);

The current shape and location of the terrain surface, outdoor as well as indoor

or under ground, is determined by estimating, in a fixed to ground coordinate system,

the position in three dimensions of points on this terrain surface, by means of azimuth

angle and range measurements in a fixed to vehicle coordinate system by means of at

least one scanning laser rangefinder, and coordinate transformation of such

measurements into coordinates in the fixed to ground coordinate system using the six

degrees of freedom position estimates in the fixed to ground coordinate system of the

fixed to vehicle coordinate system by means of the abovementioned position

determination (Fig. 7; Col. 8, lines 46-68);

The storage, processing and updating operations of the terrain surface shape

and location data are made in an on board vehicle dynamic terrain model, where data

from this model is used when optimising vehicle paths and load handling implement

movements throughout loading and unloading tasks by allowing calculations of pertinent

positions and shape elements of material volumes, other handling objects and

obstacles, where this model comprises at least three essential layers with for each

terrain element n within the work area specific elevation values (Col. 7, lines 19-59):

$Z(1,n)$ for layer number 1 : emerging model based on data from the

vehicle's actual pass in its path where this data is obtained from terrain surface

measurements (Col. 7, lines 19-59),

$Z(2,n)$ for layer number 2: best estimate of the reference surface devoid of

material volumes, other handling objects and obstacles based on initial

measurements of terrain surface inside the work area, measurements made by

either the abovementioned method element for terrain surface shape and

position estimation or by other means collected information of terrain surface

shape and position (Col. 7, lines 19-59),

$Z(3,n)$ for layer number 3: a current estimate of the entire terrain surface

within the work area including material volumes, other handling objects and

obstacles, where this dynamic terrain model is analysed in order to 1) optimise

the position of the attack point or optimising the bucket unloading position,

respectively, as well as 2) optimising the vehicle's position when attacking for

loading or when unloading the bucket, respectively, and 3) for estimating a

terrain height profile along the intended loading path of the bucket giving, for

each one of a number of successive penetration depths $sg(i)$, $i = 0, 1, 2,...$ of e.g.

the forward tip of the bucket yielding an average level Zloading(i) in a fixed to

ground coordinate system for the material volume in a neighbourhood of the

forward edge of the bucket (Col. 7, lines 19-59);

An on board mission computer is employed where this computer is provided with

mission instructions defining obstacle free zones, loading and unloading zones,

parameters for static and dynamic transport paths, reconnaissance paths, loading and

unloading paths including also programs contained in the mission instructions for

selecting and tying together a sequence of paths and movement processes in order to

assemble one or several handling cycles, and furthermore provided with algorithms for

vehicle path optimisation and vehicle and load handling implement movements when

loading and unloading based on attack point coordinates and bucket unloading point,

respectively, plus the terrain height profile {Zloading(i), sg(i), i -- 0, 1, 2,..} from the

dynamic terrain model (Fig. 2, item 100);

An on board vehicle control computer is employed for controlling vehicle and load

handling implement in the current vehicle path and the current vehicle and load handling

implement movement process based on data from the mission computer, where this

vehicle control computer has interfaces to the actuators and sensors intended for the

steering and driving of the vehicle and its load handling implements (Fig. 2, item 100).

[AS BEST UNDERSTOOD] Regarding claim 5, Stentz et al. further discloses a

method according to claim 4 for obstacle detection for the purpose of avoiding the

vehicle to get into a too close proximity of or colliding with an obstacle, to supervise the

progress of the vehicle in order to initiate an emergency action should the vehicle risk to

move outside the areas intended for autonomous navigation and in order to evaluate

and accept or reject planned vehicle paths and vehicle and load handling implement

movements, by employing the dynamic terrain model for this purpose (Fig. 2, item 84)

and characterised by:

An additional layer in the dynamic terrain model is used for marking obstacle free

terrain elements (Fig. 2, items 66-68);

Classifying an element no n in the dynamic terrain model as an obstacle free or

not obstacle free terrain element is done by continuously comparing $Z(1,n)$ of the

emerging model layer of the dynamic terrain model with the current best estimate if the

terrain surface $Z(3,n)$, whereby the element no n shall be classified as obstacle free if

$[Z(1,n) - Z(3,n)]$ H, where H is a given least obstacle height for not classifying an

element as obstacle free (Id.),

Evaluating and accepting or rejecting planned paths and considering the risk of

the vehicle moving outside those areas intended for autonomous navigation, for the

purpose of being able to detect possible planning errors prior to driving an intended

path, this evaluation is made by testing for each element no n in the dynamic terrain

model if such an element to any part contains a part of an obstacle avoidance zone

mapping for any one of the successive positions of the vehicle in the planned path,

whereby, if such a terrain element does not belong to any loading, unloading or obstacle

free zone, the planned path will be rejected, where: One or more obstacle avoidance

zones are defined in a fixed to vehicle coordinate k (Col. 4, lines 51-68), system;

A specific obstacle avoidance action can be assigned to one or more

obstacle avoidance zones (Col. 4, lines 51-68);

Obstacle avoidance zone projection is a for the moment defined surface in

the fixed to ground coordinate system, where such a surface is the horizontal

projection of a fixed to vehicle obstacle avoidance zone for a specific vehicle

position in its path (Col. 4, lines 51-68);

Obstacle avoidance zone mapping in the fixed to ground coordinate

system is the union set of a sequence of all obstacle avoidance zone projections,

where each such projection corresponds to a specific position of a sequence of

positions of the vehicle in its path (Col. 4, lines 51-68);

Obstacle avoidance action is initiated based on the presence of a non obstacle

free element no n in the dynamic terrain model inside any obstacle avoidance zone

projection for the present position of the vehicle, in which case the obstacle avoidance

actions carried out are assigned to the corresponding obstacle avoidance zone (Id.);

Obstacle avoidance action is also initiated on the presence of a non obstacle free

element no n of the dynamic terrain model inside any obstacle avoidance zone mapping

representing the planned path of the vehicle, whereby the obstacle avoidance actions to

be carried out are assigned to the corresponding obstacle avoidance zones (Id.).

[AS BEST UNDERSTOOD] Regarding claim 6, Stentz et al. further discloses a

method according to claim 4 for a vehicle in motion to find a point (Xload,Yload) or

(Xunloaa,Yunloaa) in the fixed to ground coordinate system for the initial position of its

load handling implement in a loading or unloading movement, respectively, in a volume

of material or other handling objects and where this method employs a dynamic terrain

model (Col. 5, lines 14-33) and is characterised by:

The vehicle is driven along an in advance planned reconnaissance path towards

one inside a limiting polygon defined loading or unloading zone (Col. 7, lines 19-59);

The most suitable point (Xloaa,Yloaa) for attacking the material volume when

loading is selected among the elements of the emerging layer $Z(1,n)$ of the dynamic

terrain model being most near a given initial line or point or otherwise most optimal, and

where the surface of those elements have been determined with a sufficient number of

measurements during the vehicle's approach along the reconnaissance path from a

point where 1) the value $[Z(1,n) - Z(2,n)]$ of a first element no n of the dynamic terrain

model has been determined with a sufficient number of measurements and 2) when the

inequality condition $A <= [Z(1,n) ° Z(2,n)]$ is satisfied, where A is a given least height of

the terrain surface above the reference surface, till the vehicle from this point has

travelled a given further distance along the reconnaissance path (Col. 7, lines 19-59);

Furthermore in a loading task this aforementioned search, for nearest or

otherwise most suitable attack point (Xload,Y~oaa) for the vehicle's loading bucket or

other implement, is confined to such elements no n of the dynamic terrain model for

which a condition B $[Z(1,n) - Z(2,n)]$ is valid, where B is a given least feasible loading

level above the reference surface per element (Col. 7, lines 19-59);

In an unloading task the search within the unloading zone for most remote or in

another way most suitable unloading point (X,nload,Yu,~oaa) for the vehicle's bucket or

other implement is confined to such elements of the dynamic terrain model for which the

inequality [Z(1,n) - Z(2,n)] _ C is valid, where C is a given maximum height above the

reference surface for an element for allowing unloading on this element (Col. 7, lines

19-59).

[AS BEST UNDERSTOOD] Regarding claim 7, Stentz et al. further discloses a

method according to claim 6 to fill a bucket in an automatic loading operation based on

the information of a material volume derived from a dynamic terrain model and where

the planning and optimisation of parameters for vehicle and load handling implement

movements (Col. 8, lines 46-67) is characterised by:

Parameters for the loading path of the vehicle and the lift and tilt movements of

the load handling implement are determined during the vehicle's movement along an

approach path between the first detection of a material volume and the arrival to the

attack point by employing a terrain height profile table, which is based on actual terrain

according to the emerging layer Z(1 ,n) of the dynamic terrain model for a number of

points no i = 0,1,2,3,..., with corresponding penetration depths Sg(i) along the planned

path of the loading bucket, and where the Z coordinate Zloading(i) for each such point

no i represents, in a fixed to ground coordinate system, an average value of Z(1,n) for

elements number n located in a specific proximity of the front edge of the bucket (Id.);

The volume to become loaded is calculated as the volume that will be cut out by

the bucket for a sequence of its positions k = 0,1,2,3,... in the same fixed to ground

coordinate system, according to the model for planning the vehicle and its load handling

implement movements, and from which is obtained an estimate of how deep into the

material volume the bucket must be penetrating during the loading process, and also

when lift and tilt movements shall be commenced and terminated during the final phase
of the loading operation (Id.).

[AS BEST UNDERSTOOD] Regarding claim 8, Stentz et al. further discloses a
method according to claim 7 for minimising the friction caused by the support reaction
force on the bucket when the bucket is moved towards and into a material volume (Col.
9, lines 1-16), characterised by:

Minimising the friction is done by controlling a hydraulic pressure to the lift
cylinders of the load handling implement, where the control parameters are optimised in
a model based on an estimate of, and in order to balance the total weight and moment
of the load handling implement with bucket and its expected loaded volume as a
function of penetration depth $s(k)$, $k= 0,1,2,3,...$, and the lift and tilt movement process of
the load handling implement and by employing the height profile table $Zloading(i)$, $i =
0,1,2,3,...$, from the dynamic terrain model (Col. 9, lines 1-16).

Conclusion

9.   The prior art made of record and not relied upon is considered pertinent to
applicant's disclosure.

Field et al. (4,846,297) discloses an automated guided vehicle for an unmanned,
self-propelled vehicle in the nature of a mobile robot.

Kleimenhagen et al. (5,640,323) discloses a system and method for operating an
autonomous navigation system.

Burns et al. (2002/0143461 A1) discloses a permission system for controlling interaction between autonomous vehicles in a mining operation.

Gudat et al. (5,548,516) discloses a multi-tasked navigation system and method for an autonomous land based vehicle.

Newstrom et al. (7,552,008 B2) discloses a population geospatial database for onboard intelligent vehicle applications.

Shin et al. (5,680,306) discloses a system and method for enabling a vehicle to track a path.

Sennott et al. (5,438,517) discloses a vehicle position determination system and method.

Faibish et al. (5,467,273) discloses a large movement robot including a control and navigation apparatus.

Rao et al. (5,684,696) discloses a system and method for enabling an autonomous vehicle to track a desired path.

Whittaker et al. (7,069,124 B1) discloses a robotic modeling of voids for exploration of subterranean voids.

Gay (6,691,010 B1) discloses a method for developing an algorithm to efficiently control an autonomous excavating linkage.

10.   Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to NIKHIL SRIRAMAN whose telephone number is

(571)270-5797. The examiner can normally be reached on Monday through Friday,

7:30am-5:00pm, with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Khoi Tran can be reached on 571-272-6919. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NIKHIL SRIRAMAN
Examiner
Art Unit 3664

N.S.
/KHOI TRAN/
Supervisory Patent Examiner, Art Unit 3664